NON-PUBLIC?: N
ACCESSION #: 8805240340
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Palo Verde Unit 1 PAGE: 1 of 6

DOCKET NUMBER: 05000528

TITLE: Reactor Trip Due to Personnel Error and Equipment Malfunction
EVENT DATE: 04/19/88 LER #: 88-011-00 REPORT DATE: 05/18/88

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Timothy D. Shriver, Compliance Manager
TELEPHONE #: 602-393-2521

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: FK COMPONENT: DISC MANUFACTURER: X999
REPORTABLE TO NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: At approximately 0148 MST on April 19, 1988, Palo Verde Unit 1 was in Mode 1 (POWER OPERATION) at 100% reactor (RCT) power when the unit experienced a 100% load rejection and resultant Reactor Power Cutback (RPCB). Approximately 30 seconds after the RPCB, a reactor trip occurred due to a low DNBR trip from the Core Protection Calculator (CPC)(CPU).

A control room operator (utility, licensed) inadvertently opened the motor operated disconnect (MOD) for Unit 1 Main Generator (GEN)(MOD PL-910). This initiated a load rejection and subsequent generator trip and turbine (TRB) trip resulting in a RPCB.

An interlock between MOD PL-910 and the associated 525 KV (FK) breakers (BKR) and manual disconnects PL-916 and PL-917 did not function. This allowed MOD PL-910 to o
en initiating the load rejection.

Immediate corrective action was to repair the permissive contacts on PL-916 and PL-917 and ensure that the interlock was operable. For corrective action to prevent recurrence, the interlock circuit will be electrically checked

periodically for proper operation. An Engineering Evaluation Request has been initiated for a reanalysis of the RPCB and the software/data for the CPC's. Also appropriate disciplinary action will be administered.

No previous similar events have been reported.

(End of Abstract)

I. DESCRIPTION OF WHAT OCCURRED:

A. Initial Conditions:

At approximately 0148 MST on April 19, 1988, Palo Verde Unit 1 was in Mode 1 (POWER OPERATION) at 100% reactor (RCT) power, when the unit experienced a 100% load rejection and resultant Reactor Power Cutback (RPCB). Approximately 30 seconds after the RPCB a reactor trip occurred due to a low DNBR trip from the Core Protection Calculators (CPC)(CPU).

B. Reportable Event Description (Including Dates and Approximate Times of Major Occurrences):

Event Classification: Automatic actuation of the Reactor Protection System (RPS)(JC).

On April 19, 1988, Palo Verde Unit 1 was at approximately 100% power when the control room staff (utility, licensed) was in the process of removing startup transformer (XFMR) AE-NAN-X01 from service for maintenance. A control room operator (utility, licensed) was performing the switching (HS) manipulations under the direction of a Senior Reactor Operator (SRO)(utility, licensed). The SRO was directing the evolution in accordance with an approved procedure. The control room operator was directed to open the motor operated disconnect switch (MOD)(HS) for AE-NAN-X01 (MOD PL-920). The control room operator inadvertently opened the MOD for Unit 1 Main Generator (GEN)(MOD PL-910). Although initiated, the opening of MOD PL-910, under load, should not have occurred, since an interlock exists between the MOD and the associated 525KV (FK) breakers (BKR) and manual disconnects PL-916 and PL-917. However, the interlock did not function and the MOD opened. This disconnected the generator from the electrical grid thereby causing a load rejection in Unit 1 which caused a designed generator trip and a turbine (TRB) trip resulting in a RPCB. The RPCB system is designed to allow the Nuclear Steam Supply System (NSSS) to remain at power

following a large loss of load or the loss of one of two operating main feedwater (SJ) pumps (P). This is accomplished by rapidly reducing core thermal power output and turbine power input. The RPCB operated as designed. Approximately 30 seconds after initiation of the RPCB a reactor trip occurred due to low DNBR trips from the CPC's.

After the event had begun, the operators responded appropriately by monitoring safety functions and stabilizing the plant. The Control Room Supervisor (utility, licensed) performed a diagnostic evaluation, in accordance with the approved procedure 41EP-1ZZ01 (Emergency Operations), and diagnosed the event as an uncomplicated reactor trip. The plant was stabilized in Mode 3 (HOT STANDBY) in approximately 10 minutes.

During the post-trip recovery the backup heaters (EHTR) were observed, by a control room operator (utility, licensed), to remain energized up to approximately 2265 psia before automatically deenergizing. The established setpoint to deenergize the heaters is 2225 psia.

C. Status of structures, systems, or components, that were inoperable at the start of the event that contributed to the event:

No other structures, systems, or components, were inoperable at the start of the event that contributed to the event other than the MOD interlock as discussed previously.

D. Cause of each component or system failure, if known:
An interlock on the main generator motor operated disconnect (MOD PL-910) did not function. The control scheme for MOD PL-910 includes an interlock circuit that allows operation of the MOD only when both sides of the plant termination are open. Either side can connect the main generator to the ring bus by closing a breaker and disconnect. In the case of MOD PL-910 this means that either breaker PL-915 or disconnect PL-916 and either breaker PL-918 or disconnect PL-917 must be open in order to allow remote operation of MOD PL-910. This circuit is to assure the MOD is not operated under load. At the time of the event both breakers PL-915 and PL-918 and disconnects PL-916 and PL-917 were closed.

The interlock circuit consists of "B" contacts from all three phases of the breakers and one from the disconnects. The "B" contacts on both PL-916 and PL-917 did not open to the normal position when the

disconnect was closed. With both of these "B" contacts closed there was no blocking of the operating signal from the plant. The problem was that the arm on PL-917 had sustained damage sometime during previous operations and was bent causing misadjustment of the mechanical linkage between the disconnect operating shaft and the "A" - "B" switch assembly. Additionally, disconnect PL-916 had the contacts improperly aligned.

The maintenance of the disconnects and other 525 KV yard equipment is under the jurisdiction of a participant utility. There has not been a preventative maintenance program for assuring that the interlocks are functional.

An authorized work document was initiated to troubleshoot/rework/replace as necessary to correct any problems found with the backup heaters. Troubleshooting did not identify any problems. The heaters cycled on and off at the proper setpoints.

E. Failure mode, mechanism, and effect of each failed component, if known:

With both manual disconnects in the condition identified above, MOD PL-910 had the permissive to operate. While opening under load the "C" phase of MOD PL-910 faulted and migrated up the bus (BU) over the insulators (INS) and up to the tower (TWR) crossbar. The insulators on "C" phase were damaged and had to be replaced.

F. For failures of components with multiple functions, list of systems or secondary functions that were also affected:

Not applicable - the interlocks do not have multiple functions.

G. For failure that rendered a train of a safety system inoperable, estimated elapsed time from the discovery of the failure until the train was returned to service:

Not applicable - no safety systems were rendered inoperable.

H. Method of discovery of each component of system failure or procedural error:

The opening of MOD PL-910 was identified by the control room staff via annunciator (ANN) alarms (ALM) and various main control board (MCBD) indications. Subsequent investigation by the participant

utility, responsible for the 525KV switchyard, confirmed the failure of the interlock.

I. Cause of event:

The cause of the initiation of the event described herein was a cognitive personnel error on the part of the control room operator (utility, licensed) who was performing the switching on the main control board. A contributing cause was the interlock which did not perform its intended function. The control room operator's lack of "attention to detail" resulted in his operation of the wrong switch. The error was contrary to an approved procedure. The procedure provides sufficient guidance in performing this evolution.

Prior to and during the event, the operators were utilizing the appropriate approved procedures which they were following in a step-wise fashion. The evolution was being directed by an SRO who

was acting as Assistant Shift Supervisor. The operators have stated that there was no confusion as to which handswitch was the proper one to be operated. There were no unusual characteristics of the work location and no other personnel errors that contributed to the event.

The cause of the reactor trip was a low DNBR calculation of the CPCs. Following a load rejection, a 25 second timer causes the CPCs to use the "last" calculated values of Radial Peaking Factors (RPF). In this case, those values corresponded to the 100% - "All Rods Out (ARO)" configuration. When the timer times-out the CPCs update their calculations for the current Control Element Assembly (CEA) configuration. In this case, the RPF changed from the ARO value to an appropriate value for CEA groups 5 and 4 inserted and group 3 partially inserted. This resulted in the integrated one-pin peak changing from approximately 1.6 to a value of approximately 2.34 (from the CPC trip buffer). These RPF values, as calculated by the CPC's, led to a low DNBR trip at approximately 57% power. In general, these high values of RPFs will always result in a reactor trip at this power and CEA configuration.

The RPFs stored in the CPCs were changed as a result of the analysis performed for Cycle 2. (For example, the CPC data base RPF for group 5 and 4 inserted was changed from the Cycle 1 value of 1.68 to a Cycle 2 value of 2.13. corresponding to a 27% reduction in overpower margin.)

J. Safety System Response:

Reactor Protection System trip.

There were no other Engineered Safety Feature (ESF)(JE) or RPS actuations and none were required.

K. Failed Component Information:

The manual disconnects with the interlocks were manufactured by Southern States and are type EV, with specification number 323. They are 525KV, 3000 ampere disconnect switches.

II. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THIS EVENT:

As described above, the reactor tripped as designed and all safety responses necessary to place the plant in a stable condition worked properly. There were no ESF actuations and none were required. Based on the above, this event had no impact on the health and safety of the public.

III. CORRECTIVE ACTIONS:

A. Immediate:

The damage to the contacts was repaired by cleaning and redressing. The manual arm on PL-917 was repaired and the contacts on PL-916 and PL-917 were reset and verified. Testing was performed to verify manual disconnect permissive, breaker permissive and combinations of breaker and manual disconnect permissive.

B. Action to Prevent Recurrence:

The responsible control room operator will receive appropriate disciplinary action.

An Engineering Evaluation Request (EER) has been initiated to perform a reanalysis of the RPCB and to evaluate whether CPC software/data can be revised to allow the unit to respond to a RPCB without tripping due to the CPC low DNBR condition.

In addition, the participant utility plans to check the adjustment

of the "A" and "B" contacts every time the adjacent breaker is taken out of service on a planned maintenance. This will be approximately once a year. At that time the interlock circuit will also be electrically checked for proper operation.

As stated in Section D, troubleshooting did not identify a potential cause of the heaters not deenergizing until 2265 psia was reached. Based upon the results of the troubleshooting, no further actions are planned at this time.

IV. PREVIOUS SIMILAR EVENTS:

No previous similar events have been reported.

ATTACHMENT # 1 TO ANO # 8805240340 PAGE: 1 of 1

Arizona Nuclear Power Project
P.O. BOX 52034 PHOENIX, ARIZONA 85072-2034
192-00374-JGH/TDS/JEM
May 18, 1988

U. S. Nuclear Regulatory Commission
NRC Document Control Desk
Washington, D.C. 20555

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 1
Docket No. STN 50-528 (License No. NPF-41)
Licensee Event Report 88-011-00
File: 88-020-404

Attached please find Licensee Event Report (LER) No. 88-011-00 prepared and submitted pursuant to 10CFR 50.73. In accordance with 10CFR 50.73(d), we are herewith forwarding a copy of the LER to the Regional Administrator of the Region V office.

If you have any questions, please contact T. D. Shriver, Compliance Manager at (602) 393-2521.

Very truly yours,
/s/ J. G. Haynes
J. G. Haynes
Vice President
Nuclear Production

JGH/TDS/JEM/kj
Attachment
cc: O. M. DeMichele (all w/a)
E. E. Van Brunt, Jr.
J. B. Martin
T. J. Polich
E. A. Licitra
A. C. Gehr
INPO Records Center

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